

REMARKS

Claims 1, 2, 4-6, 8-15, and 17-20 are pending in the application. Claim 1 is currently amended. No new matter is entered upon entry of these amendments.

Claim 1 is amended to lift the restriction that the nanoporous carbons derived have any particular nanopore size distribution. The concept of “reproducibly produced” finds support in the specification, *inter alia*, page 3, line 29, where the pore size is said to be “controlled with better than 0.05 nm accuracy,” the term “controlled” containing an inherent definition of reproducible results.

Applicant wishes to thank the Examiner for the helpful comments presented at the end of the pending Office Action, especially related to narrow pore size distributions.

Before addressing the individual rejections presented by the Examiner, Applicant wishes to address two common comments made within each of the rejections. In the first, the Examiner characterizes controlling reproducibility of the range of “from about 0.05 nm to about 0.2 nm” as reading upon “an attempt to duplicate an experiment but having a small unavoidable minor temperature fluctuation between runs.” So as to moot this characterization, Applicant is providing with this response an affidavit which, in part, describes the degree to which levels of nanoporosity can be controlled with careful control of temperature alone. There are many circumstances where reproducible control to this level is technically and commercially advantageous – tuning of supercapacitor or gas storage compositions being just two example. As described in previous responses (all of which are incorporated by reference herein for this purpose), others have used significantly more complicated procedures in attempting to control nanoporosity to the levels described by the instant invention, including post etching and / or carbonizing of initially produced nanopores. The present ability to provide this level of control by first pass varying and control of temperature alone is a significant improvement over previous attempts.

The second comment made by the Examiner, common to several of the rejections, is that “since the claims permit freely choosing small differences in temperature to get essentially the same result [of small differences in nanopore diameters].” In fact, none of the references cited

within the pending (or past) Office Action(s) actually describes or discloses using small differences in temperature to get the results described within the instant application, nor do any of them suggest any desirable results from using small differences in temperature, nor do they provide any reason that it should be possible to achieve small differences in nanopore sizes using small differences in temperature. In fact, while *it may seem obvious in hindsight* to try such an approach, it is only in hindsight that one may consider it to be obvious to either try or achieve the results described in this application. As described in previous responses, and in the affidavit provided with this reply, the conventional thinking at the time of this invention was that changes in nanopore sizes were limited by the integral dimensions of graphitic layers (i.e., about 0.3 nm) and that tuning such as described in the instant application was not possible. Accordingly, in the absence of forbidden hindsight analysis based on the teaching of the instant application, the fact that the instant claims permit freely choosing small differences in temperature to get essentially the same result cannot be used as evidence of obviousness.

I. **Claim Rejections under 35 U.S.C. §103(a) – the Leis reference**

Claims 1, 4-6, 8, 9, 11-15, 17, 19, and 20 stand rejected under 35 U.S.C. §103(a), as being allegedly obvious over Leis J., *et al.*, “Carbon nanostructures produced by chlorinating aluminum carbide,” *Carbon*, 2001, 39, 2043-2048 (hereinafter “the Leis reference”). Applicants respectfully traverse this rejection on the following grounds.

The standard for establishing a *prima facie* case of obviousness requires that three basic criteria must be met. First, there must be some suggestion or motivation to modify the reference or to combine reference teachings, either in the reference itself or in the knowledge generally available to one of ordinary skill in the art. Second, there must be a reasonable expectation of success. Finally, the prior art reference must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on Applicants’ disclosure. MPEP § 2143, *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438.

Applicants submit that the Examiner has not met the burden required to meet these requirements.

Claim 1 provides a method of reacting a first and a second quantity of a metal or metalloid carbide composition with a halogen at a first and second temperature in the range of from about 200°C to about 1400°C to produce carbide derived carbons having nanopores which differ in mean diameters in the range of from about 0.05 nm to about 0.2 nm, and with sufficient control that the mean nanopore diameter of the second quantity of carbide-derived carbon is within the range of from about 0.05 nm to about 0.2 nm of a selected value.

According to the Examiner, the Leis reference teaches reacting AIC and halogen gas at several temperatures, with “no difference seen in the product porosity.” (Office Action dated 6/16/10, page 2, lines 5-6). The Leis reference does not disclose or suggest the ability to produce two sets of carbide derived carbons having nanopores which differ in mean diameters in the range of from about 0.05 nm to about 0.2 nm, with sufficient control that the mean nanopore diameter of the second quantity of carbide-derived carbon is reproducibly within the range of from about 0.05 nm to about 0.2 nm of a selected value. At best, the Leis reference discloses that reacting AIC with halogen at different temperatures to produce carbons having porosities which differ by the approximate thickness of a graphitic layer – i.e., 0.3 nm (Table 1). This thickness is a significantly larger difference than the instant invention (where the term “significant” is used to reflect differences in previous thinking, which has been described in earlier responses, rather than actual magnitude).

Not only does the single Leis reference fail to teach or suggest all the claim limitations of the rejected claims, but it also provides no suggestion that it was possible to achieve the levels of control described in the instant invention, nor any motivation for even attempting to achieve the presently described invention. As such, it provides no support for a *prima facie* case of obviousness as a matter of law.

Accordingly, Applicant requests reconsideration and withdrawal of this rejection.

II. **Claim Rejections under 35 U.S.C. § 103(a) – the Leis and El-Raghy references**

Claims 1, 2, 4-6, 8-15, and 17-20 stand rejected under 35 U.S.C. §103(a), as being allegedly unpatentable over the Leis reference, taken with El-Raghy, *et al.*, *J. Appl. Phys.*, 1998, 83(1): 112-119 (hereinafter “the El-Raghy reference”). Applicants traverse this rejection as well.

To the extent that the Leis reference fails to teach or suggest all the claim limitations of the rejected claims, the El-Raghy reference cures none of these deficiencies. The El-Raghy reference provides no suggestion that it was possible to achieve the levels of control described in the instant invention, nor any motivation for even attempting to achieve the presently described invention.

El-Raghy simply teaches a composite of TiC and SiC. The Examiner states that it would be an obvious expedient to make the desired carbon, noting that the Leis reference teaches carbides as useful starting materials in the introduction, making an “obvious to try” analogy. However, as there are literally thousands of carbides available, it is not clear why a person of ordinary skill in the art would even consider trying to halogenate such materials, much less expect to see any different results than available from the carbide materials of the Leis reference. The situation here is analogous to that described in *In re Kubin*, 2009 U.S. App. LEXIS 6914 (Fed. Cir. 2009), where the Federal Circuit outlined two classes of situations where “obvious to try” is erroneously equated with obviousness under § 103: “In the first class of cases, . . . what would have been “obvious to try” would have been to vary all parameters or try each of numerous possible choices until one possibly arrived at a successful result, where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful. . . . In such circumstances, where a defendant merely throws metaphorical darts at a board filled with combinatorial prior art possibilities, courts should not succumb to hindsight claims of obviousness.” *Id.*

With no direction to achieve the invention described herein, or even a knowledge that the present invention was possible, it cannot be said that it would have been obvious to combine the teachings of the Leis and El-Raghy references and achieve the instant invention.

Accordingly, Applicant submits that the Examiner has failed to establish a *prima facie* case for obviousness, and the Applicants respectfully request reconsideration and withdrawal of this rejection.

III. **Claim Rejections under 35 U.S.C. §103(a) – the Boehm reference.**

Claims 1, 4-6, 8-15, 19, and 20 stand rejected under 35 U.S.C. 103(a), as allegedly obvious over Boehm, *et al.*, Proc. 12th Biennial Conf. on Carbon, 1975, pp. 149-150 (hereinafter “the Boehm reference”). Applicants traverse this rejection as well, for the same reasons as previously presented for the Leis and El-Raghy references.

According to the Examiner, the Boehm reference “[p]age 149 teaches narrow-pore distribution carbon made from reacting TaC with [sic] at 500C. The results of several different temperatures are plotted and correlated.” However, and as stated in Applicant’s last response to this same basis of rejection, the discussion on page 149 is limited to that of changes in crystallographic cell parameters, a feature not contained or correlated with nanopore size of the rejected claims. Even to the extent that page 150 (Figure 2) of Boehm describes pore volume, it does not describe nanopore diameter, as described in these claims. As such, Boehm does not show “each and every element as set forth in the claim,” and as such, fails the all-elements test for obviousness (i.e., the prior art reference must teach or suggest all the claim limitations. MPEP § 2143, *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438).

Accordingly, Applicants request reconsideration and withdrawal of the rejection.

IV. **Claim Rejections under 35 U.S.C. §103(a) – the Mohun reference.**

Claims 1, 4, 6, 8-14, 17, 19, and 20 stand rejected under 35 U.S.C. 103(a), as allegedly obvious over U.S. Patent 3,066,099 (hereinafter “the Mohun reference”). Applicants traverse this rejection as well, for the same reasons as previously presented for the Leis, El-Raghy, and Boehm references, as well as those comments made in the introductory remarks.

Specifically, the Examiner remarks that “[t]he reference teaches, especially in col. 6, 10, 35, and 36 heating SiC with chlorine at various temperatures to make a microporous material.

No difference is seen in the pore distribution.” (Office Action dated 6/16/10, page 3, 2nd paragraph).

Even to the extent that the Mohun reference may describe microporous materials having *individual* pore distributions similar to those described in the present invention, Applicants are unable to identify any teaching within this reference which would suggest the limitations of any of the claims currently rejected, nor suggestion that it is worthwhile or possible to achieve them. In the absence of such teaching, Applicants request reconsideration and withdrawal of the rejection.

Conclusion

Applicants believe that the foregoing constitutes a complete and full response to the Office Action of record. Applicants respectfully submit that claims 1, 2, 4-6, 8-15, 17, 18 and 20 are in condition for allowance and entry of the present amendments and notification to that effect is earnestly requested.

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